Office of the Federal Coordinator
for
Meteorological Services and Supporting Research

Session Notes

National Hurricane Conference Training Session: Improving Public Response to Hurricane Warnings

Tuesday, April 18, 2000
8:30 a.m. to 10:00 a.m.
Location: Regency F, Third Floor

Moderators:

Ms. Cynthia Nelson — Senior Staff Meteorologist/Coordinator for Meteorological Programs, Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM), Silver Spring, MD

Mr. Scott Kiser — Program Manager for Hurricane Operations, Headquarters, National Weather Service, Silver Spring, MD

Rapporteur:

Lt. Col. Michael Babcock (USAF) — Assistant Federal Coordinator for the Department of Defense, Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM), Silver Spring, MD

Introduction

Cynthia Nelson opened the session by introducing herself and Scott Kiser as the session moderators. She then provided an overview of the session and described its purpose. The goal was to examine four areas related to the public's response to hurricane warnings to provide ideas to session attendees and to open a dialogue on ways to improve that response. The four areas were societal and behavioral response, communications, education, and public outreach.

Societal Response/Behavioral Aspects

Dr. Betty Hearn Morrow — Co-Director of the Laboratory for Social and Behavioral Research, International Hurricane Center, Florida International University, Associate Professor, Department of Sociology and Anthropology, Miami, FL

"Behavioral Response to Warnings"

Dr. Morrow discussed how people decide whether to heed warnings. She identified a three-step process that proceeds from risk assessment to decision to action and five factors that comprise this process. After hearing the warnings, the person must first perceive that the storm is dangerous. Next, they must understand that they are in danger, decide whether to take action, consider feasible alternatives based on

economic and social aspects, and decide what action to take. Based on a survey after Hurricane Andrew, the public appears to understand that Category 4 and 5 storms contain dangerous winds and storm surge, but they do not necessarily understand that flooding is another type of danger associated with a hurricane. In addition, it appears that gender differences and what the neighbors are doing will influence actions taken by a household. Dr. Morrow next discussed the Decision Model developed by the International Hurricane Center, which was based on the research conducted following Hurricane Andrew, and how it can assist the public officials in predicting the response of the public. This expert system predicted about 85% of the decisions correctly. The complexity of these decision processes was clear.

In the area of "action," she identified four factors that influence results. *Autonomy* includes control over property or resources. *Economic resources* include availability of shutters, cars, and cash. *Physical resources* include things like strength and health. And finally *knowledge* includes information and experience.

From telephone interviews of 1200 south Florida households following Hurricane Georges, 72% of those surveyed felt that the authorities were telling them everything, 75% felt TV portrayed the situation accurately, 88% expressed confidence in their county emergency manager, and 96% expressed confidence in the National Hurricane Center. She also presented results describing the relationship between Hurricane Georges evacuation and what households will do the next time. Two key considerations that govern the people's actions are (1) whether the action is best for the individual/family or not and (2) whether the requested action was from public officials/authorities or not. The survey data indicated that most, who did evacuate, would do so again, and many, which did not evacuate, would do so the next time. She stated that these encouraging results would probably fade with time as the memory of Georges aged.

Dr. Morrow also presented survey results from two counties in south Florida that highlighted how differently these groups made decisions, emphasizing that we must understand each of the warned communities to know how they will respond. One of the ways to do this is to use vulnerability maps to visualize the expected societal response. Based on Dr. Morrow's survey results, communities could be divided into those that will and can respond, and those that will probably not respond. The maps could then be used by the local Emergency Managers to target assistance and resources (education, communications, and transportation) toward non-response areas for the purpose of improving the public's response to warnings. Delay in being able to return to their homes also affects the likelihood of future evacuation and must be considered in the warning process. She also described an interesting effect of the media in delayed return decision-making. When the media portrayed extensive delay, it was more likely to make delayed return a consideration in future evacuation decisions.

It is clear that people are assessing the risks and making their own decisions, highlighting the need to better understand these decision-making processes. Effective warnings reflect knowledge of the targeted households and communities. Diverse communities mean we need to have a variety of message modes. One way Dr. Morrow recommended to picture the community is to develop GIS vulnerability maps that represent the human factor and population patterns, and then to combine or overlay this with the risk of physical hazards. This would give the communities' emergency managers a picture of potential problem areas for evacuation and mitigation efforts. Dr. Morrow also announced a June 4 – 6, 2000, conference in Miami Beach on the subject of reaching women and children in disasters.

Dr. Jay Baker Department of Geography, Florida State University, Tallahassee, FL

"Decision Response Model and Preliminary Hurricane Floyd Behavioral Analysis"

Dr. Baker first described four important points that are part of understanding the public's response and necessary for building a response model. First, evacuation orders are the most effective means for evoking a response from the public, as long as they are heard and understood by those who need to respond. Second, people must understand their own personal vulnerability such as what the hurricane will do to their home and family. One problem is that the public tends to underestimate high risks and overestimate low risks. Third, we need to tell and convince people they need only go a certain distance to be safe. And fourth, we need to know and use the public's sources of information to disseminate warnings.

He next described his Decision Response Model that shows how people make decisions during a tropical cyclone threat. The input to the model includes whether to evacuate, when to evacuate, where to seek refuge, and how far to travel to a refuge. Using this model, a behavior analysis of actions during Hurricane Floyd was initiated, and the results were obtained from a survey of households stretching from the Florida Keys to North Carolina. It showed many people who reside in Category 1 surge areas think their homes are safe even in a Category 3 storm. Others who aren't at high risk to surge and wave action perceived they were in danger, and they would be likely to contribute to a "shadow evacuation" problem. Regardless of location, the perception of an official evacuation order leads to higher actual evacuations, including some evacuations from areas we don't want to evacuate. The highest participation was from areas where entire counties were told to leave. Clearly many people do not correctly understand their vulnerability to the risk to which they are exposed. This analysis clearly showed that the three most important points that account for the most variability in evacuation decisions were: 1) whether people believed they heard evacuation notices from public officials; 2) where they lived by risk category; and 3) what they believed was their vulnerability.

Dr. Baker also presented statistics from this survey that showed that local TV is the main source of information and was relied upon by 75% of the survey respondents. Other sources, in decreasing order of use, are The Weather Channel (55%), radio (31%), CNN, word of mouth, other cable TV sources, the Internet, and America Online (AOL). Some of the more high tech sources (Internet and AOL) were the least used by the public, although this does not mean these sources should be ignored.

The survey also asked what people would do next time. Even with traffic congestion, the encouraging responses included the following: still evacuate, be receptive to adjusting their time of evacuation, use less direct and secondary routes, welcome real-time information about roads, and consider going to nearby destinations if available.

He concluded by stating that it is critical that we improve people's understanding of their own risk and that we get the right message to them. His recommendations on policy changes are:

1. Better educate the public regarding their vulnerability,
2. Word and disseminate evacuation notices to ensure they are not misinterpreted,
3. Tell people what to do and why, and
4. Don't forget those who didn't leave but should have.

Communications

Mr. John Sokich — Office of Strategic Planning and Policy, Headquarters, National Weather Service, Silver Spring, MD

"Public Response and Where They Get the Message"

Mr. Sokich reviewed how weather and warning information is disseminated today, in the near future (3-5 years), and in the distant future (10 years and beyond) to the public, emergency managers, media, and public officials, and commercial vendors. He stated that the most important aspect of disseminating warning information is that the public hears one voice, with the National Hurricane Center being that voice, and that the message be repeated often and through multiple means.

Multiple dissemination methods are used today by the NWS and emergency managers. The public usually receives their information via TV, The Weather Channel, radio, NOAA Weather Radio, pagers, and the Internet. In general, commercial weather services receive information over the Family of Services line, NOAAPORT, NOAA Weather Wire, and the Internet, and emergency managers receive information from NWS via NOAA Weather Wire and Radio, Emergency Managers Weather Information Network (EMWIN), Internet, hot lines (phone), pagers, and Law Enforcement Telecommunications Systems. He also described how the media receive information from multiple sources on both the public and private sector sides. NOAA Weather Radio is a key dissemination method and is particularly effective because its tone-alert function can immediately reach people when a threat or change in forecast occurs. However, individual ownership is still low, and some receivers are of poor quality.

In the near future, he foresees TVs that turn themselves on with an alert and use the Secondary Audio Program to reach a broader audience. Wireless communication is exploding, and he expects this to become an important dissemination method in the future. Automatic alerts through e-mail and Internet connections will be possible, and other technologies such as Reverse 911 will provide more avenues to reach the public. NOAA Weather Radio will continue to be a primary method as well as pager technology in use today. The dissemination of NWS information to commercial weather services and emergency managers will continue to use many of today's sources but will include more Internet and wireless communications. The NWS' Advanced Weather Interactive Processing System (AWIPS) will also provide additional methods of dissemination through its Local Data Acquisition and Dissemination (LDAD) system capability.

In the distant future, he envisions a wireless communications Internet-type system he calls I-Net. Warning information will be easily transmitted to smart receivers of many types, including cell phones, pagers, personal digital assistants, wristwatches, and satellite feeds that can go directly into vehicles. The I-Net will be a primary mode to provide NWS information to commercial weather services as well as emergency managers. The next generation EMWIN and LDAD "Plus" will also provide means of dissemination to emergency managers.

Dr. Steve Lyons The Weather Channel, Atlanta, GA

"Communications: How are we doing?"

Much of the general public receives its weather and warning information from the media and its "media interpreters." It's critically important that these "interpreters" get the right message to the public, since the majority of the public receives the message through the media. As a result, it is important for the weather community to serve the media to be effective in getting the message out to the public. Although TV reaches the highest percentage of the public, radio is often one of the few remaining sources of local information after a hurricane strike, and therefore, we must not neglect this mode of dissemination.

Dr. Lyons stated that we must also focus on describing the impacts of the expected weather rather than just the meteorological parameters such as wind speeds and rainfall amounts, if we expect the public to respond correctly. This can be accomplished when the media tells their "story." How this story is told is also important. The media, NWS, and emergency managers need to work together to overcome problems with the varied skill, knowledge, and training of the "media interpreters," and even occasionally, a problem with some of these "interpreters" making their own forecasts which creates a mixed message for the public.

We need to look at what the public gets versus what the public needs in the areas of both weather information and emergency management information. In the area of weather information, they need to know what will happen to them. If you only give the weather information, they will not respond. If you give both the weather and the impact, the public is more likely to respond especially if it is localized. In the area of emergency management information, they need to be told what to do, when to do it, and the existing localized situation in a direct, straightforward manner. This can often be easier than describing the expected weather impacts but we can still get the wrong people responding to the message.

He stated that how the media conveys (emphasizes) the impacts makes a huge difference in how the public will respond. He felt that in the area of information and communications, the public generally has good access to weather information but poorer access to timely emergency management information, especially on the national level. He then described the new capability at The Weather Channel to communicate emergency management information to the public through its "Emergency Management Bulletin" system. The system allows EM information down to the county level to be forwarded through state emergency operation centers to The Weather Channel and to be shown in an on-screen crawler only in the local area affected.

Education

Dr. Rocky Lopes Senior Associate for Disaster Education, American Red Cross Headquarters, Disaster Services Department, Falls Church, VA

"The Message and Education"

Dr. Lopes presented four key points for improving public response. First, he emphasized the importance of presenting a consistent message, including ensuring that all of the sources of warning information are

saying the same thing. The more consistent the information delivered to the public, the more likely they are to respond the way you want.

Second, we must also repeat the message many times to make sure the word gets out to as many people as possible. This is especially important for those people that do not have high tech capabilities, may not be watching TV or may not be listening to the radio all the time.

Third, the message needs to be positive and direct. Tell the target population what to do instead of what not to do. If possible, we need to explain why the action is needed. If they understand the why, they are more likely to take action. We should also give one choice of action and not multiple choices. We also need to be very aware of what we are saying, especially when warnings are translated into other languages. He provided a humorous example where a hurricane warning message had been translated into something entirely different, and totally defeated the desire to get that sector of the public to respond.

Fourth, we must select the appropriate messages. We need to provide specific and concise advice to the public. We also need to work with our media partners to focus on a few critical messages, e.g., why they should evacuate, when they should go, what supplies they need, and how to protect their property. Telling only a few things to do is more likely to elicit a response. In addition, you may have to target your audience. For example, if a family is barely getting by, they will not be able to fathom preparing emergency rations and may just ignore the message altogether.

Finally, Dr. Lopes described the new publication "Talking about Disasters: A Guide for Standard Messages" as a way to improve consistency. The guide covers 13 hazards, as well as general preparedness information, for before, during, and after an event. It was reviewed, approved, and endorsed by eight national organizations: Federal Emergency Management Administration (FEMA), National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), National Fire Protection Association (NFPA), Institute for Business and Home Safety (IBHS), International Association of Emergency Managers (IAEM), U.S. Department of Agriculture (USDA), and the American Red Cross. It is completely in the public domain and available in hard copy from any Red Cross local chapter and on two Internet sites:

http://redcross.org/disaster/safety/guide.html
http://www.fema.gov/pte/talkdiz/resources.html

Dr. Lopes was pleased to note that since the publication of the guide, the consistency of messages has dramatically improved. During Hurricane Floyd, he noted that the messages contained consistent and precise information.

Dr. Chris Adams Co-Director of the Flash Flood Laboratory, Cooperative Institute for Research in the Atmosphere, Colorado State University, Fort Collins, CO

"Educational Needs"

Dr. Adams stated that education is needed most of all on 1) weather and hazards and 2) their impacts. He mentioned two field courses covering education of the public as well as public officials and the National Hurricane Center's one-week course for emergency managers. He also highlighted the training program

called "Community Hurricane Preparedness" sponsored by FEMA and the NWS. The program is available over the web or by CD-ROM. It is targeted at city and county level emergency managers as well as decision-makers, such as mayors, city managers, and state officials who rely on the emergency managers' advice to make decisions about how their communities are going to prepare and respond to a hurricane threat.

In addition, there is a need to further develop and use decision aids to help deal with the complexities of both the natural environment and the societal and political components of the situation, as well as their interaction. Joint training among the NWS local offices, local and state officials, and the media is also essential. Finally, he also recommended joint decision-making exercises among the weather service providers, local officials, emergency managers, and the media to assist with deciding what is needed and who needs it during an event. Communities should identify goals and then communicate to the public what is needed. Any plans developed should be arrived at jointly, keeping the NWS WFO, emergency managers, media, and emergency responders in the loop, which will lead to more effective responses.

Public Outreach

Mr. Paul Trotter — Meteorologist-in-Charge, New Orleans/Baton Rouge Area National Weather Service Forecast Office, Slidell, LA

"Meteorological Ministry – What's the 411, 911, and 111"

Mr. Trotter described the importance of information (411), emergency action (911), and the end users (111). He stated that meteorologists are tasked with teaching and preaching the hurricane preparedness message, and using all communication modes to reach the public. Awareness efforts can be improved through partnering with other agencies, and he highlighted the potential benefits of regional task forces and the TPC/NHC's Hurricane Tour.

He described the Hurricane Local Statement (HLS) as a supplement to the TPC/NHC warning information that should focus on vital information such as shelters, evacuation clauses, and other locally specific information and be in a bullet format. He also mentioned that the Hurricane Liaison Team, which is located at the TPC/NHC, should be familiar with the local areas that will be affected by a storm. He highlighted the role of education, especially in the schools, on weather hazards, cautioned against assuming that high technology preparedness messages are reaching everyone, and recommended that we need to assess what is being done and answer the key questions. He also emphasized the need for frequency and consistency of warnings and evacuation messages. He highlighted the value of the conference calls for coordination with the TPC/NHC.

Mr. John Gambel — National Hurricane Coordinator, Federal Emergency Management Agency, Washington, DC

"Big Problem"

Mr. Gambel stated that we have a serious problem with the migration of a significant number of our population to coastal regions, including on to the barrier islands. Sufficient plans to handle the problem do not exist. The transportation infrastructure is unable to handle evacuation. There is a lack of adequate shelters in key locations, along with the lack of adequate temporary housing for evacuees both in and out of state. To overcome these shortfalls, we need to pull together. First, we can't count on getting everyone out so be prepared to handle this. Second, we need comprehensive strategies on both the local and state levels for helping those that stay, including transportation, and sheltering/temporary housing. He offered New Orleans as an example of the refuge problem by asking how the city would protect 500,000 people who didn't evacuate for a hurricane that flooded the city. He stated that shelters should be accessible to the highways, and last refuge shelters need to be identified. FEMA stands ready to assist the state and local officials with tools, sample plans, and strategies.

Next, he described the U.S. Southeast Hurricane Evacuation Study, which evaluated the evacuation response in Hurricane Floyd. It looked at better tools to assist in planning and monitoring evacuations: using a behavior analysis model, building a web-based evacuation travel demand forecasting system, and studying traffic conditions, lane reversal standards, and intelligent transportation system (ITS) strategies.

Question and Answer Period

Q. Concerning the Emergency Management Bulletin at The Weather Channel, how do emergency managers access it?
A. The Weather Channel receives the information through state emergency operations centers. More information will be available during the course of the conference.

Q: The Hurricane Local Statement (HLS) is a cumbersome product with lots of information—does The Weather Channel use it? How can it be improved and made more useful?
A1. The Weather Channel reads all of the messages. Part of the problem is the length of the message and they are not always familiar with the local area. They would also like to see more impacts in the statement instead of the meteorological parameters.
A2. The NWS has revised the format of the HLS to have underlined text headers to assist in finding the needed information.

Q. Has anyone looked at a difference in warning response between households in single family homes and those in high rise apartments or condominiums? Also for rural versus urban areas?
A. Only limited data are available, primarily from a study done on Long Island, NY, following Hurricane Gloria. They did not see a big difference. A big difference has been seen for those living in manufactured housing (mobile homes), with many more households evacuating such structures. More research is needed in this area.

Summary and Wrap-Up

Cynthia Nelson thanked the speakers for their participation in the session and identified the following key points from the presentations:

- Vulnerability mapping
- Response modeling
- Consistency of message
- Diverse public requires many modes of communication
- Need to state the impacts versus the meteorological parameters
- Repeat the message
- Use the guide for standardized messages
- Emphasize training for emergency managers, local officials, and children
- Use of multimedia to reach the public
- Must reach the end users

She asked for any other inputs from the audience to be sent to her by e-mail. Her e-mail address is Cynthia.Nelson@noaa.gov.

OFCM will be taking the information presented here and the results of discussions from this session to help develop future courses of action for the federal meteorological community.

Ms. Nelson concluded by asking everyone to make sure they entered attendance information in the books at the back of the room and that she would make available the results of this session as soon as possible.

Recommendations for follow-on work:

1. Consult with FEMA (Map Modernization Program) to investigate the possibility of including societal vulnerability mapping within the framework of the program. Point of contact at FEMA: Douglas A. Bellomo (doug.bellomo@fema.gov) Recommend local Project Impact studies that could produce vulnerability mapping based on Dr. Morrow's decision analysis model and work with the local community on how to use the maps to improve response.

2. Continue to focus on education (Note: tough to separate education and public outreach). Should plan a training session at the next NHC on how to better educate the populace on their vulnerability to and the impacts of tropical cyclones. Recommend to NHC organizers that the Natural Disaster Education Coalition give a report on their activities and progress during the general session.

3. Develop a model for integrating and coordinating the inputs from the weather community (impacts), the emergency management community (response), and the media to ensure a frequent and consistent message is delivered to the public. A first step may be to identify known success stories and build on

those successes or develop a prototype experiment or model. One possibility is to devise a project impact study that would test the local impact of improvements or changes to NWS and EM products.

4. Recommend that the Interagency Coordinating Committee on Hurricanes (ICCOH) and the OFCM Committee on Environmental Services, Operations, and Research Needs work together to assess what is already being done and what is needed to improve public response. This assessment should cover the gamut from Federal down to local levels and include universities and private industry. It should look at:

   + Education for all levels, including public, EM, Meteorologists, etc… on impacts of tropical cyclones
   + Societal response modeling and evaluations
   + Communications plans for all public levels
   + Ways to improve messages to the public, including consistency and impact descriptions

   This assessment should then be used to make program and policy recommendations on how to fill the gaps.

5. Use an OFCM Communications Joint Action Group to work on the gamut of communications issues.

6. Recommend that the American Meteorological Society endorse and adopt the "Talking About Disasters: Guide for Standard Messages" as a standard for communications with the public. The guide is already endorsed by the following organizations: FEMA, NOAA/NWS, USGS, NFPA, IBHS, IAEM, USDA/CSREES, and the American Red Cross.